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Increase in detection and resolution power in TLC by means of heating during development

Two factors are important in chromatographic work for the detection of each component from the investigated mixture. It is necessery that each component be separated from the other components and that the concentration in the center of the zone or spot be higher than the sensitivity limit of the reagent.

During the chromatographic process, the concentration in the center of the spot or zone diminishes, but resolution increases. Evidently for smaller R_F differences, development must be longer.

Generally in TLC, the length from the starting point to the front is about

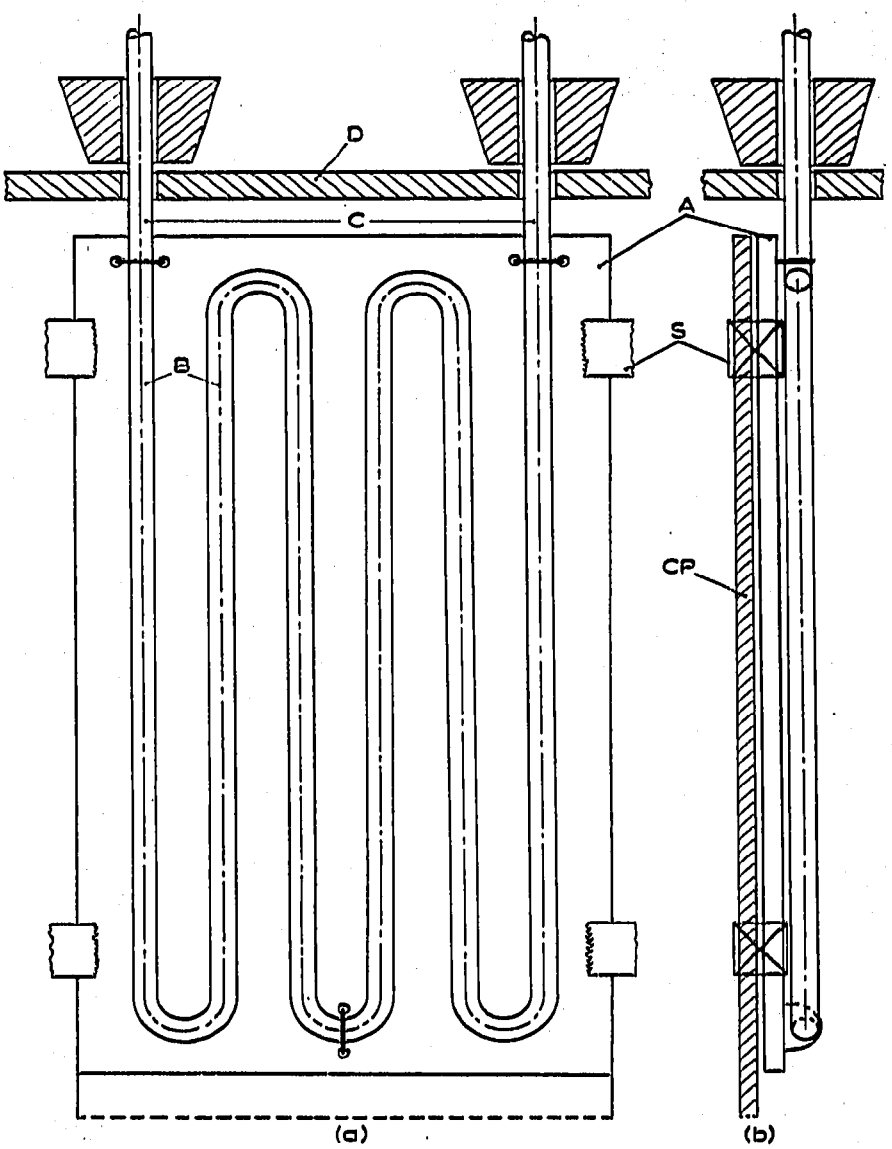


Fig. 1. The figure shows the construction of the hot plate: (a) back, (b) crosssection, A = aluminium plate, B = resistance wire, C = glass tube, D = covering glass plate, CP = chromatographic plate.

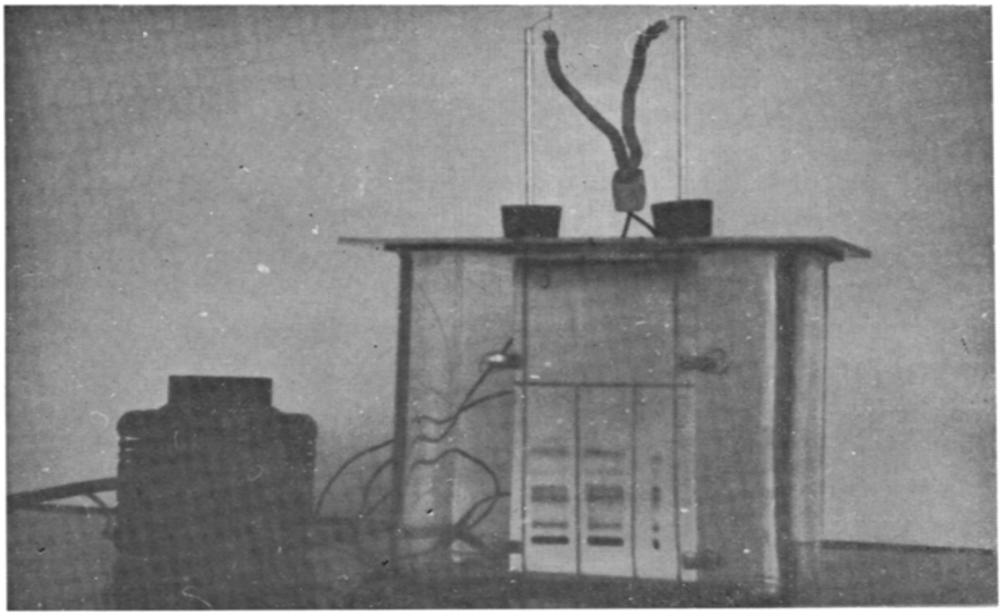
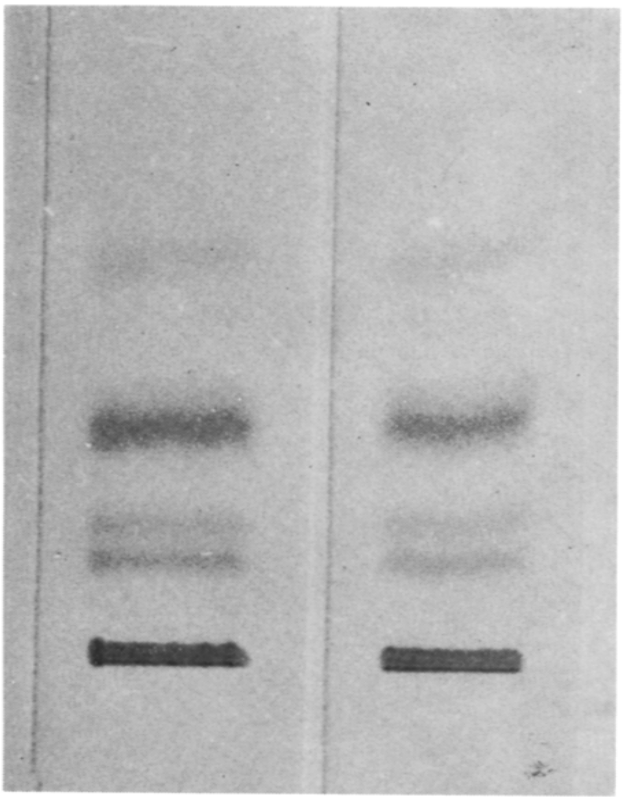


Fig. 2. The chromatographic chamber is shown with the chromatographic plate attached to the hot plate in which the temperature is regulated with a Variac transformer.



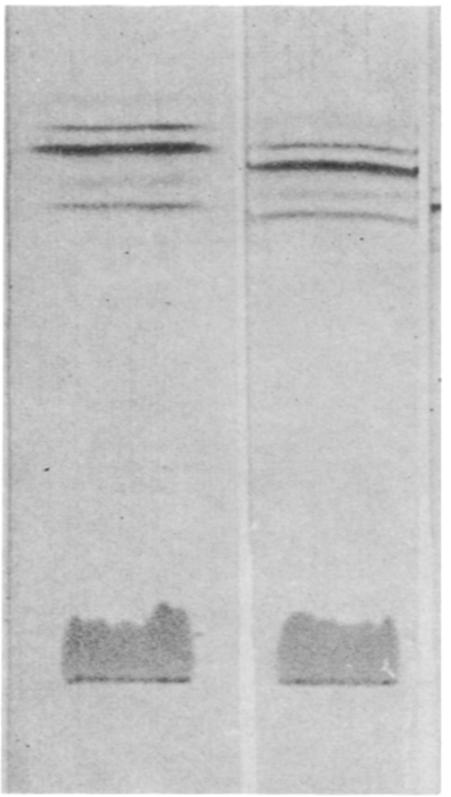


Fig. 3. The figure shows the chromatogram obtained with usual development in a very well saturated chamber. The components are (from below): Sudan brown, Sudan red III, Sudan blue, Fettrot, Sudan violet and Fettreingelb. Developing time: 20 min; solvent: toluene.

Fig. 4. The figure shows the chromatogram obtained by development on the hot plate. The components are similar to those on the chromatogram in Fig. 3: Sudan brown, Sudan red III, Sudan blue, Fettrot, Sudan violet and Fettreingelb. Developing time: 1 hour; solvent: toluene.

10–15 cm, and it is often impossible to recognise trace components. A method to improve this situation is described in this Note. The chromatographic plate is heated during the developing process, the solvent evaporates from the plate and the concentration in the center of the spot or zone increases.

Experimental

The experiments were carried out on a standard plate (10 cm × 20 cm) with a layer of Silica Gel H (thickness—0.25 mm) made with a Desaga apparatus[1]. The construction of the heater is shown in Fig. 1. The aluminium plate (A—10 cm × 20 cm × 3 mm) is heated with an electrically heated wire (B) which passes through the resistance glass tube (C). Through the two holes in the glass plate covering the vessel (D) pass the ends of the glass tube and they are fixed with two stoppers. The chromatographic plate (CP) is attached on the aluminium plate with four clamps (S). With the Variac transformer (Fig. 2) it is possible to regulate the temperature of the plate. The chromatogram was developed with toluene. The test mixture to be separated was composed of Sudan brown, Sudan blue, Sudan red III, Fettrot, Sudan violet and Fettreingelb. The chromatogram obtained with normal development is shown in Fig. 3, and the chromatogram developed with the heating of the plate in Fig. 4. The developing time for the chromatogram in Fig. 3 is about 20 min, and for the chromatogram in Fig. 4 about 1 h.

Conclusion

The experiments show that the heating and evaporation of the solvent during the chromatographic process gives better results; the concentration of the compounds in the spot center is evidently greater and the resolution is better.

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1 E. STAHL, *Dünnschicht-Chromatographie*, 2.Auflage, Springer-Verlag, Berlin, 1967, p. 53.

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